

Serial No. 09/873,674

Attorney Docket No. F0537

**REJECTION OF CLAIMS UNDER 35 U.S.C. § 112**

Claims 1-14 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Claim 1 has been amended to remove the functional limits regarding the ON and OFF states of the device which may have been vague and indefinite. Therefore, claim 1 is not indefinite for failing to particularly point out and distinctly claim the subject matter, which the Applicant regards as the invention. Thus, withdrawal of this rejection is respectfully requested for at least the following reasons. The additional amendments to claim 1 will be further discussed below.

**REJECTION OF CLAIMS UNDER 35 U.S.C. § 102**

Claims 1 and 2 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,962,895 issued to Beyer et al. ("Beyer"). Withdrawal of the rejection is respectfully requested for at least the following reasons.

Claim 1, *intra alia*, includes "a **first gate** defining a first channel region interposed between a source and a drain formed within the active region of the SOI substrate; a **second gate straddling the first gate** defining second channel regions interposed between the first channel region and the source and the drain; and a contact connecting the first gate with the second gate..." Beyer does not teach a straddled gate device including a first gate and a second gate as claimed in claim 1. Further, Beyer does not teach or suggest a contact connecting the first gate with the second gate as claimed in claim 1.

To the contrary, Beyer discloses a self-aligned **body contact** in a SOI transistor. The self-aligned body contact 140 is formed through an extension to the gate to the body 102 (see, for example, the Abstract, Figs. 6 and 7). As illustrated in Fig. 7, a gate G is shown with a gate extension 110. An aperture 212' is formed in the gate extension 110, as shown in Fig. 3. Subsequently, spacers 132 are formed within the aperture and on the exposed sidewalls of the sidewall members generally denoted by the reference numeral 205. The sidewall members include a gate poly 110 above a gate oxide 101 and top sidewalls formed from nitride 120. (See, for example, Fig. 5 and col. 2, line 55 to col. 3, line

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14). Finally, a poly layer 140 is deposited, doped with an appropriate dopant, and patterned and annealed to form the body contact (see, for example, Fig. 6 and col. 3, lines 9-11).

A contact, as understood by those having ordinary skill in the art, is formed of a conductive material, for example, metal, polysilicon, silicide or the like, which provides a connection to, for example, the gate, the source, the drain or the body. The disclosed device overcomes some of the disadvantages due to the floating body effect. For example, a voltage applied to the electrical contact sets the voltage of the body 102 because the body contact 140 is directly coupled to the body 102.

On the other hand, a gate is a structure used to control output current (i.e., flow of carriers in the channel, in, for example, a field effect transistor). A conventional gate structure typically includes an active region of a semiconductor device, also known as the body, a gate dielectric interposed between the active region and a gate electrode. The width of the gate electrode defines the length of the channel interposed between the source and the drain. Thus, Beyer does not teach or suggest a straddled gate device having a first gate and a second gate as claimed in claim 1.

Since Beyer does not teach one or more of the features as claimed in amended claim 1, claim 1 and the claims that depend directly or indirectly from amended claim 1 are patentable over Beyer.

#### **REJECTION OF CLAIMS UNDER 35 U.S.C. § 103**

Claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Beyer et al. and further in view of U.S. Patent No. 5,164,805 issued to Lee ("Lee"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 3 as amended depends directly from claim 1. Claim 3 is patentable for at least the reasons stated above in regards to amended claim 1 in view of Beyer, i.e., Beyer does not teach or suggest all of the features of amended claim 1. Further, Lee does not make up for the deficiencies of Beyer. Specifically, Lee does not teach or suggest a first gate and a second gate straddling the first gate as claimed in claim 1. Therefore, there would be no motivation to combine Lee with Beyer to form the device of claim 1. In fact, the combination of Lee with Beyer would not form the device of claim 1 as currently claimed. Therefore,

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since Beyer alone or in combination with Lee does not teach or suggest all of the features of claim 1, claim 3 which depends directly from claim 1 is patentable over Beyer in view of Lee.

Claim 4 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Beyer et al. and further in view of U.S. Patent No. 5,567,966 issued to Hwang ("Hwang"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 4 depends directly from claim 1. Claim 4 is patentable for at least the reasons stated above with regards to claim 1 in view of Beyer, i.e., Beyer does not teach or suggest a first gate defining a first channel region and a second gate straddling the first gate defining second channel regions. Further, Hwang does not make up for the deficiencies of Beyer. Specifically, Hwang does not teach or suggest a first gate straddled by a second gate. Since Beyer alone or in combination with Hwang does not teach or suggest all of the features of claim 1, claim 4 which depends directly from claim 1 is patentable over Beyer in view of Hwang.

Claims 5-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Beyer et al. and further in view of U.S. Patent No. 5,625,217 issued to Chau et al. ("Chau"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claims 5-8 depend directly or indirectly from claim 1. Claims 5-8 are patentable for at least the reasons stated above with regard to claim 1 in view of Beyer. Further, Chau does not make up for the deficiencies of Beyer. For example, Chau does not teach or suggest "a first gate defining a first channel region ... a second gate straddling the first gate defining second channel regions..." as claimed in claim 1. Therefore, since Beyer alone or in combination with Chau does not teach or fairly suggest all of the features of claim 1, claims 5-8 which depend directly or indirectly from claim 1 are patentable over Beyer in view of Chau.

Claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Beyer et al. and further in view of U.S. Patent No. 6,424,009 issued to Ju ("Ju"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 10 depends directly from claim 1. Claim 10 is patentable for at least the reasons stated above with regards to claim 1 from which claim 10 depends directly, i.e.,

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Beyer does not teach or suggest all the features of claim 1. Further, Ju does not make up for the deficiencies of Beyer. Specifically, Ju does not teach or suggest "a first gate defining a first channel region ... a second gate straddling the first gate". Since Beyer alone or in combination with Ju does not teach or suggest all the features of claim 1, claim 10, which depends directly from claim 1, is patentable over Beyer in view of Ju.

Claims 11-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Beyer et al. in view of Ju and further in view of Chau et al. Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claims 11-13 depend directly or indirectly from claim 10. Claims 11-13 are patentable for at least the reasons stated above with regards to claim 10 in view Beyer and further in view of Ju. Further, Chau does not make up for the deficiencies of Beyer modified by Ju. Specifically, Chau does not teach or suggest, "a first gate ... a second gate straddling the first gate". Since Beyer alone or in combination with Ju and further in view of Chau does not teach or suggest all of the features of claim 1, claims 11-13 which depend indirectly from claim 1 are patentable over Beyer in view of Ju and further in view of Chau.

Since claim 1 was amended to remove the vague or indefinite terms, claims 9 and 14 that depend directly or indirectly from claim 1 are patentable for at least the reasons stated above with regard with claim 1.

#### **NEW CLAIM**

The newly added dependent claim, i.e., claim 21, defines additional novel and unobvious features of the present invention. Specifically, claim 21 claims "when the device is in an off state ( $I_{off}$ ), an effective channel length is defined by the first gate and the second gate, and when the device is in the on state ( $I_{on}$ ) state, the effective channel length is defined by the first gate." The functional limits of claim 21 in view of claim 1 as discussed above are not taught or suggested by Beyer, Lee, Hwang, Chau or Ju, alone or in combination. Therefore, newly added 21 is patentable for at least the reasons given above for the patentability of claim 1.

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**CONCLUSION**

In light of the foregoing, it is respectfully submitted that the present application is in condition for allowance and notice to that effect is hereby requested. If it is determined that the application is not in condition for allowance, the Examiner is invited to initiate a telephone interview with the undersigned attorney to expedite prosecution of the present invention.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 18-0988; Our Order No. F0537 (AMDSP0429US).

Respectfully submitted,

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APPENDIX A to  
**REPLY TO OFFICE ACTION DATED JULY 31, 2002**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re patent application of:

Applicant: Zoran Krivokapic

Serial No: 09/873,674

Filing Date: June 4, 2001

Art Unit: 2815

Examiner: Jesse A. Fenty

**FAX COPY RECEIVED****OCT 30 2002**Title: **STRADDLED GATE FDSOI DEVICE**

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Below is a marked-up version of the amended portions of the present application.  
Added text is underlined and deleted text is bracketed and struck through (i.e., [example]).

1. (Amended) A straddled gate device formed on a semiconductor-on-insulator (SOI) substrate having active regions defined by isolation regions and an insulator layer, the device comprising:

a first gate defining a first channel region interposed between a source and a drain formed within the active region of the SOI substrate;

a second gate straddling the first gate defining second channel regions interposed between the first channel region and the source and the drain; and

a contact connecting the first gate with the second gate [wherein when the device is in the off state ( $I_{off}$ ) the first channel region and second channel regions define a long channel and when the device is in the on state ( $I_{on}$ ) the first channel region defines a short channel].

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**APPENDIX B – COMPLETE SET OF CLAIMS**

In re patent application of:

Applicant: Zoran Krivokapic

Serial No: 09/873,674

Filing Date: June 4, 2001

Art Unit: 2815

Examiner: Jesse A. Fenty

Title: **STRADDLED GATE FDSOI DEVICE****FAX COPY RECEIVED**

OCT 30 2002

TECHNOLOGY CENTER 2800

1. A straddled gate device formed on a semiconductor-on-insulator (SOI) substrate having active regions defined by isolation regions and an insulator layer, the device comprising:
  - a first gate defining a first channel region interposed between a source and a drain formed within the active region of the SOI substrate;
  - a second gate straddling the first gate defining second channel regions interposed between the first channel region and the source and the drain; and
  - a contact connecting the first gate with the second gate.
2. The straddled gate device according to claim 1, wherein the first gate defines a work function and the second gate defines a second work function.
3. The straddled gate device according to claim 2, wherein the second work function of the second gate is 0.3 – 0.5 eV less than the work function of the first gate.
4. The straddled gate device according to claim 1, wherein the source and the drain include main source and drain regions and source and drain extension regions.

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5. The straddled gate device according to claim 1, includes a silicide layer formed on the main source and drain regions.

6. The straddled gate device according to claim 5, wherein the silicide layer which is formed on the main source and drain regions has a thickness in a range between 100 Å and 400 Å.

7. The straddled gate device according to claim 1, including a second silicide layer formed on electrodes of the second gate.

8. The straddled gate device according to claim 7, wherein the thickness of the second silicide layer formed on the electrodes of the second gate has a range between 100 Å and 400 Å.

9. The straddled gate device according to claim 1, wherein the silicide layer formed on the main source and drain regions and the second silicide layer formed on the electrode of the gate are of silicide of different species.

10. The straddled gate device according to claim 1, wherein the semiconductor-on-insulator substrate is a germanium-on-insulator (GOI) substrate.

11. The straddled gate device according to claim 10, wherein the silicide layer which is formed on the main source and drain regions and the source and drain extension regions has a thickness in a range between 100 Å and 400 Å.

12. The straddled gate device according to claim 10, including a second silicide layer formed on electrodes of the second gate.



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13. The straddled gate device according to claim 12, wherein the thickness of the second silicide layer formed on the electrode of the gate has a range between 100 Å and 400 Å.

14. The straddled gate device according to claim 13, wherein the silicide layer formed on the main source and drain regions and the second silicide layer formed on the electrodes of the second gate are of silicide of different species.

21. The straddled gate device according to claim 1, wherein when the device is in an off state ( $I_{off}$ ), a length of an active channel is defined by the first gate and the second gate and when the device is in the on state ( $I_{on}$ ), the length of the active channel is defined by the first gate.

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